



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Alaska Fisheries Science Center
Resource Assessment and Conservation Engineering Division
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CRUISE RESULTS

MILLER FREEMAN CRUISE NO. 93-11 EFFECTS OF TRAWL WIDTH VARIATION ON CATCHABILITY

Experiments were carried out September 17-26 aboard the R/V Miller Freeman in Marmot Bay, Alaska, to test for variation in survey trawl catching efficiency resulting from variation in trawl width. Previous research has shown that the operating shape of survey trawls does vary consistently with narrower, higher configurations when towed in shallow water. While measurement of trawl dimensions could be used to compensate for the resulting differences in the seafloor area swept by the trawl, it was unknown whether trawl shape variation changed the proportion of fish in the trawl path which were retained in the catch (catchability).

AREA OF OPERATIONS

All operations were conducted in Marmot Bay, an inlet in the northeastern end of Kodiak Island, Alaska.

OBJECTIVES

1. Test how variation in trawl width affects the efficiency of survey trawls in sampling fish populations.
2. Test a system to control trawl width variation using a restraining line between the towing warps.
3. Observe fish reactions to the trawl system (vessel, warps, doors, bridles, and trawl) using sonar equipment mounted on the Miller Freeman and the Monarch launch.
4. Document the operating configuration of National Marine Fisheries Service sampling trawls using trawl-mounted video equipment.



SCHEDULE

September 17	Loaded vessel in Kodiak, Alaska
September 18-26	Comparison trawling operations
September 27	Unloaded vessel in Kodiak, Alaska

METHODS

A series of tows of the polyethylene Nor'eastern trawl (90-ft headrope and 105-ft footrope) were conducted in Marmot Bay, Alaska, to evaluate the effects of trawl shape variation on catchability of groundfish. Each pair of tows included one tow with a 16-m restraining line attached between the towing cables 100 m ahead of the trawl doors and one tow without this line. The line restricted the trawl opening, resulting in a narrow, tall configuration similar to that which occurs in shallow water tows. Acoustic trawl mensuration equipment was used to monitor the distance between the doors, as well as the horizontal and vertical opening of the net. All tows were 15 minutes long at a speed of 3 knots and conducted during daylight hours. Water depth at the comparison site was approximately 200 m.

Weights and numbers of each species in each catch were measured using standard Resource Assessment and Conservation Engineering (RACE) Division sampling procedures. A sample of each major commercial species was measured for size composition.

The distribution of midwater fish during the trawling experiment was observed using a scientific echo sounder aboard the Miller Freeman. Recording of these data was taken both during towing and while running between trawl tow sites.

Observations of pollock reactions to demersal trawl gear were collected using a scientific echo sounder and data-collection system mounted in a small boat while trawl hauls were being conducted by the Miller Freeman. Data were collected at a fixed location as the trawl was pulled beneath the acoustics vessel. Detailed analyses of this high resolution data set are currently being performed.

A trawl-mounted video system was used during nighttime hours to observe the groundgear behavior of two groundfish survey bottom trawls (the polyethylene Nor'eastern bottom trawl and the 83-112 Eastern bottom trawl) used by the RACE Division.

RESULTS

Thirty-eight tows were conducted in the trawling experiment, of which two were unusable, resulting in 18 pairs of comparison tows. The restrictor method was effective in varying trawl

shape. Trawl opening dimensions averaged 13.3 m wide and 7.7 m high with the restrictor and 15.6 m wide and 6.6 m high without. The principal species caught were arrowtooth flounder (Atheresthes stomias), walleye pollock (Theragra chalcogramma), and flathead sole (Hippoglossoides elassodon).

Preliminary comparisons of catch rates indicated significantly higher catchability in the narrow configuration for each of the above major species. Catch per area swept ratios were 1.16 for arrowtooth flounder, 1.10 for flathead sole, and 1.43 for walleye pollock. The higher value for pollock may be related to their distribution above the seafloor, making them more vulnerable to the higher openings of the narrow configuration trawls. It is also possible that the restrictor itself enhances the tendency of pollock to dive toward the seafloor as the towing cables pass. Some of the acoustic observations made from the small boat while the trawl system passed indicated that such diving behavior could be quite significant.

Video observations of survey trawl groundgear were made during 14 nighttime trawl tows. While low visibility was a problem during most of the tows, some useful observations were made. The central area of the roller gear of the polyethylene Nor'eastern trawl maintained consistent contact with the seafloor. However, the long spaces between rollers provided escape paths for a number of fish.

SCIENTIFIC PERSONNEL

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